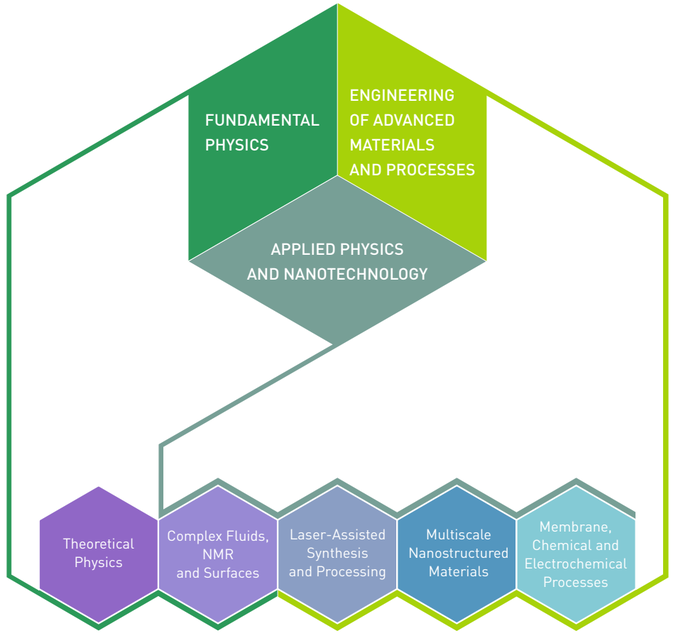
THEMATIC LINES RESEARCH GROUPS



CeFEMA Mission

- Advancing materials science and engineering by carrying out theoretical and experimental research to the highest international scientific standards
- Carrying out advanced education and training of young researchers at the highest scientific level
- Promoting knowledge transfer, and applying this knowledge to regional, national and international development
- Pursuing industrially-oriented projects and technology transfer to industry
- Establishing itself as a reference centre for research in selected thematic areas

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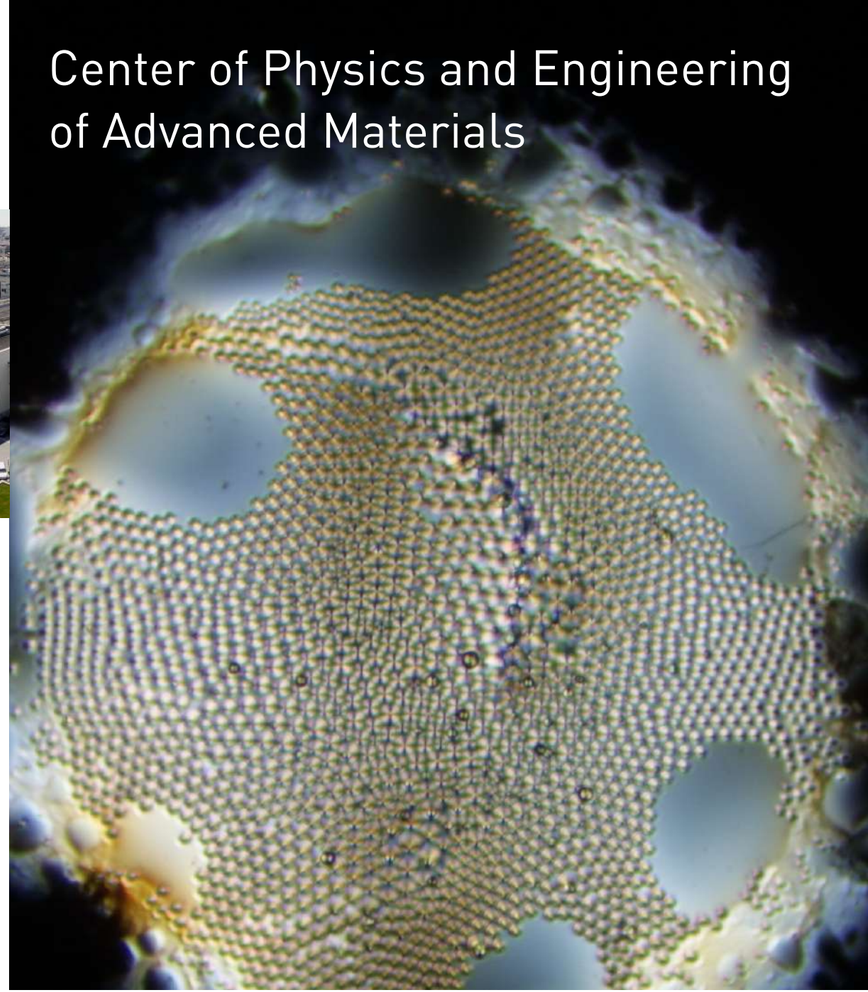
Center of Physics and Engineering of Advanced Materials



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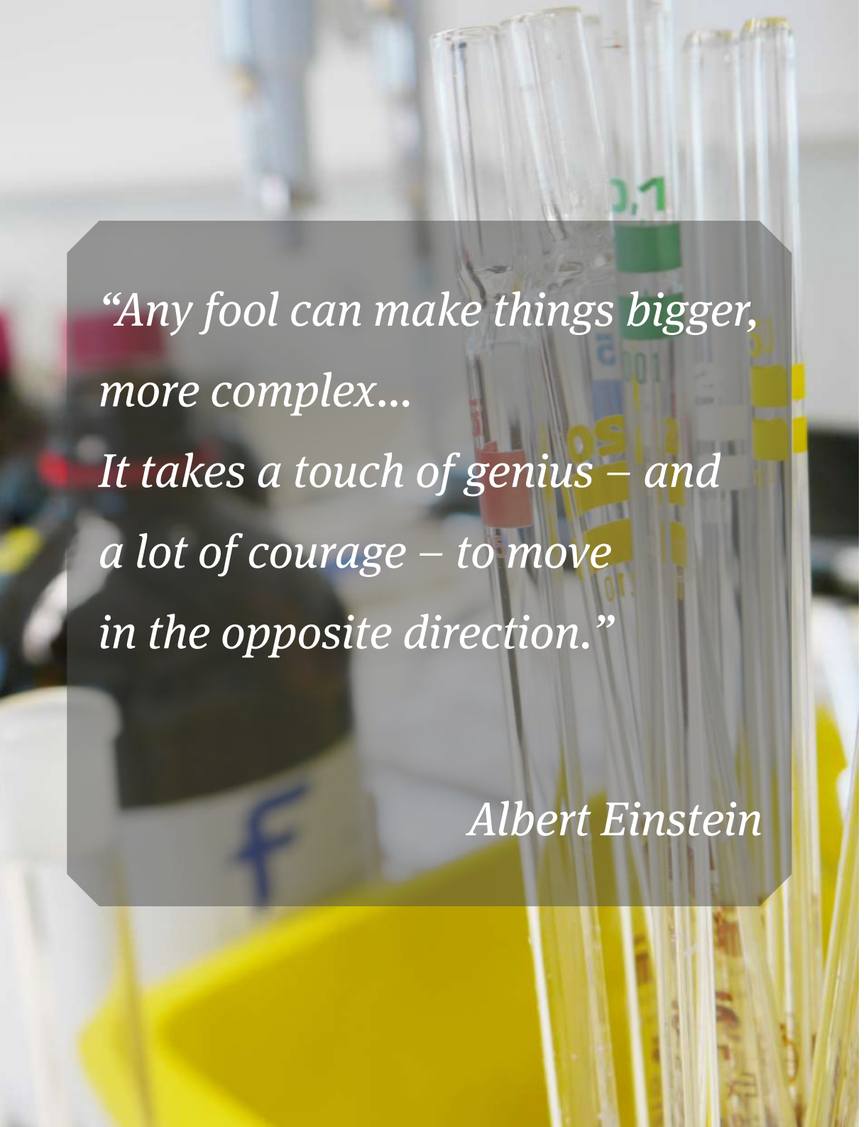

"Any fool can make things bigger, more complex...
It takes a touch of genius – and a lot of courage – to move in the opposite direction."

Albert Einstein

FAR FROM EQUILIBRIUM MATERIALS AND PROCESSES

LASP · MNM · TP

INTERDISCIPLINARY RESEARCH COOPERATION

KEY ENABLING TECHNOLOGIES

MATERIALS & STRUCTURES
- Superconducting / ferroelectric
- Metal / insulators / insulators heterostructures
- Nanostructured materials
- Optical materials

SIMULATIONS
- FFE phase transitions and their relaxation to equilibrium
- FFE non-linear laser excitation processes

EXPERIMENTAL TECHNIQUES
- Temperature quenches
- Electric and magnetic field perturbations
- Tightly focused laser beams
- High resolution SEM and TEM

APPLICATIONS & TECHNOLOGY TRANSFER

INFORMATION AND COMMUNICATION TECHNOLOGIES
- Nanoelectronics
- Photonics
- Superconductors

ENERGY CONVERSION & ENVIRONMENT
- Thermoelectrical devices
- Sensors
- Energy storage and solar cells

HEALTH
- Drug delivery
- Osseointegration

GRAPHENE AND OTHER LOW DIMENSIONAL MATERIALS

LASP · TP

INTERDISCIPLINARY RESEARCH COOPERATION

KEY ENABLING TECHNOLOGIES

GRAPHENE
- Laser assisted synthesis
- Plasma assisted synthesis
- Graphene oxide

NOVEL 2D MATERIALS
- Molibdenum and Tungsten chalcogenides
- Molibdenum and Tungsten oxides

HETEROSTRUCTURES
- Heterolayers of low dimensional materials

APPLICATIONS & TECHNOLOGY TRANSFER

INFORMATION AND COMMUNICATION TECHNOLOGIES
- Electronics
- Spintronics
- Optoelectronics

ENERGY
- Supercapacitors
- Superlubricity
- Solar cells

HEALTH & FOOD
- Chemical sensing with single molecule detection

FUNCTIONAL MATERIALS

LASP · MNM · TP · MCEP

INTERDISCIPLINARY RESEARCH COOPERATION

KEY ENABLING TECHNOLOGIES

SYNTHETIC MEMBRANES
- Polymeric
- Mixed matrix
- Bio and hemocompatible
- Tunable surface functionality

NANOSTRUCTURED MATERIALS
- Energy storage
- Energy conversion
- High temperature
- Self-lubricated

BIOCOMPATIBLE MATERIALS
- Multimaterials biocompatible constructs
- Materials resistant to wear / corrosion in bodily fluids

APPLICATIONS & TECHNOLOGY TRANSFER

ENVIRONMENT
- Efficient and intensive membrane-based industrial processes
- Electrochemical processes for wastewater treatment

ENERGY
- Fuel cells and advanced batteries
- Electrolysers for H_2 production
- Thermoelectrical devices
- Lightweight materials for low cost transportation
- Materials for extreme heat and radiation conditions

HEALTH & FOOD
- Bio and hemocompatible membrane-based artificial organs
- Prosthesis and dental implants
- Membrane applications in functional foods and nutraceuticals

SOFT MATTER

CFNMRS · MNM · TP · MCEP

INTERDISCIPLINARY RESEARCH COOPERATION

KEY ENABLING TECHNOLOGIES

LIQUID CRYSTALS
- Electro-optical cells
- LC sensors
- Surfactants
- Biocompatible / biomimetic systems

POLYMERS, OLIGOMERS & DENDRIMERS
- Biopolymers
- LC polymers and dendrimers
- Drug delivery / encapsulation systems
- Membranes

IONIC LIQUIDS
- Non-polluting solvents
- Ionic liquids in membranes
- CO_2 capture
- Ionic LC systems
- Electrolytes mixtures

APPLICATIONS & TECHNOLOGY TRANSFER

ENVIRONMENT
- "Green Chemistry" industrial processes
- Low environmental impact cleaning products and electro-optical displays

ENERGY
- Fuel cells
- Advanced batteries
- Storage devices

HEALTH
- Dendrimer based drugs and drug delivery agents
- NMR contrast agents
- LC based medical sensors
- High resolution medical displays
- Food security